Communication Networks and New Communication Technology

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The purpose of these notes is to indicate possible effects of new technology on the effectiveness of communication networks. In order to discuss communication networks sensibly it is necessary to distinguish three sorts of networks.

Types of Networks

1. Radio

Radio waves can be represented by expanding circles or beams which move out from the transmitter past possible receiving sites. An advantage of radio is that it can take the same message to an almost unlimited number of destinations. Disadvantages of radio are (1) poor quality in distant or unfavorable receiving sites (2) only a limited number of frequency channels are available. In some degree these can be reused in different geographical areas; but this can cause trouble in areas of overlap. Radio is used for:

a. Long-distance non-directional telephone and telegraph communication.
b. Mobile telephone communication to automobiles, planes and ships.
c. Radio and TV broadcast of news, entertainment, advertising and educational material.
d. In the form of directive beams of microwaves, radio supplies (in the US) over half the long-distance on trunk telephone circuits and TV program circuits. Microwave radio via satellite supplies an increasing number of long-distance transoceanic telephone and TV circuits.

At present there is an increasing competition for radio frequencies between mobile telephone for automobiles and (UHF) television.

2. Tree Networks

A tree network originates at one point and branches out to many receiving locations. It looks like a tree. Examples of tree networks are:

a. Teletypewriter news networks.
b. Cable TV networks.

Like radio broadcast, tree networks are very economical for sending the same message to many destinations. They are essentially one-way in structure, from the root to the branches, two-way communication of a sort can be achieved by time sharing (one user uses one frequency channel at a time) or by message switching (a code attached to a message assures that it gets to a particular destination).

3. Switched Networks

We can achieve communication between any pair or group of users by line switching. The network required for this purpose is hierarchical in nature. All users in a local area are connected by individual circuits to a common switching point. Switching points in a city are interconnected by interoffice trunk circuits. Toll trunks connect toll switching offices to one another and to local switching offices.

Examples of switched networks are: teletypewriter networks, telephone networks, the picturephone or video-telephone network put in service in Pittsburgh, Pennsylvania in June 1970.

4. Private Networks of Any Kind

New Technology

There are various general categories of technology which affect several areas of communication. The most powerful are the transistor and ensuing solid-state devices including integrated circuits. These make communication and computer equipment increasingly small, low-power, cheap and reliable. Communication satellites are another new technology. Coherent light from lasers will in a decade or so begin to have a substantial impact on communication. What sort of effects may we expect from technological advances on various sorts of communication?

Advances in the Use of Communication

Broadcast from Satellites

The advantages of TV or radio broadcast from satellites are that it can reach a huge number of receivers with the same programs. The disadvantages are the cost of the satellite, and of the many ground receiving stations. It seems most likely to be of use in developing countries, to enable the government to reach almost all the people. A single receiving station in a village would send signals to a few TV sets by a tree cable network. The economics may be marginal. Direct broadcast from satellite seems unsuited to the varied needs of a high technology society.

Cable TV

Broadcast TV inherently provides only a few channels, all covering a large geographical area. This leads to expensive programs which are acceptable and attractive to the largest possible audience. The strength of such programs is their wide interest and their high technical quality. However, broadcast TV programs cannot satisfy the interests and needs of numerically small groups, and leave many cold or disenchanted. Further, in appealing to a large audience, TV news and public affairs programs interest and excite that audience about national and moral affairs of which the viewers can have little solid knowledge and over which they have almost no control. The viewers are left excited, exasperated and helpless.

Cable TV systems can provide many cheap channels to viewers in a small geographical area. A few of these channels can be used for general interest network programs. Others can be made available for local news and local public affairs, or can be used by local groups who do their own thing. A cable TV network can be subdivided or segmented so that some programs are sent only to certain boroughs, school districts, or ethnic neighborhoods. Thus, cable TV makes possible programs and news about things that interest and affect the viewer directly, and things that are to some degree in his control.

If the phone was used in conjunction with cable TV in a small geographical area, school board meetings, «town meetings» and discussions with panels of experts could be conducted. Viewers would watch officials or panel members by cable TV and speak to them or question them by telephone.

While cable TV can fill many needs that broadcast TV cannot, it still has its limitations. TV gives a wonderful sense of what is, of what man has accomplished. It is poor in giving a sense of process, of how things are accomplished. Sweat, manipulation, the learning of participation and apprenticeship don't come across on TV.

In areas of intellectual skill, such as mathematics, computer - aided instruction can challenge the individual learner, note his mistakes and applaud his success. Computer - aided instruction requires full two-way communication between each learner and the computer, for the computer treats each learner differently, responding to his particular successes and failures. This full two way communication goes beyond cable TV as we know it.

While computer aided instruction can teach a wide range of mental skills, it cannot, or cannot yet teach the physical skills of sport, craftsmanship and art. Doxiadis is right; communities should be designed so that children and adults meet real people and the real world and its work face to face.

Switched Networks

Technology will probably affect the internal nature of switched networks in more ways than it will affect broadcast and tree networks. This is because switched networks are far more complicated and flexible. New switched networks for data transmission will be constructed sharing the facilities used for telephony. Communication satellites are already used for transoceanic telephony. When higher microwave frequencies are used, there will be enough channels for many domestic circuits as well as for transoceanic circuits.

Picturephone or video telephone service is already a reality in Pittsburgh. It will spread. Initially, it will be too costly to replace travel between cities for long conferences. The use of satellite circuits, laser communication and higher-frequency microwaves will continually lower the cost.

There is a growing communication with computers over the switched networks. This will increase as terminals become cheaper and more satisfactory, Such communication will have informational and instructional as well as computational uses.

We may look forward to the transmission of pulse, blood pressure, temperature and so on from patient to physician or computer.

The Most Powerful Technological Prospects

No one knows what men will invent in the future. Of the things we have or which are in sight here are some with very great potentialities:

- Better integrated circuits.
- Cheaper computer memories.
- Means for recording TV signals.
- Digital transmission of telephone and video signals.
- Cheaper and better computer terminals.
- Solid-state devices for high microwave frequencies.
- Low-loss glass fibres for transmitting laser light for kilometers.
- Solid-state losers.
- Improved communication satellites using higher microwave frequencies.